



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/200,495	11/25/1998	PETER C. VAN BUSKIRK	2771-337(PC8	4898
25559	7590	01/23/2004	EXAMINER	
ATMI, INC. 7 COMMERCE DRIVE DANBURY, CT 06810			HU, SHOUXIANG	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 01/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/200,495

Applicant(s)

VAN BUSKIRK ET AL.

Examiner

Shouxiang Hu

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 40-47, 49, 51-54, 61 and 63 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 40-47, 49, 51-54, 61 and 63 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

1. Claims 40-47, 49, 51-54 and 61 are objected to because of the following informalities and/or defects:
  2. Claim 40 recites the term of "a pure metal top electrode" and claim 52 recites that oxygen is not incorporated in the electrode material, but the disclosure fails to definitely define what is the exact purity of the metal top electrode. According to the specification, the recited top electrode is formed in the presence of oxygen, which naturally results in certain oxygen elements existing in the metal top electrode. And, the disclosure does not adequately describe how to form an absolutely pure metal top electrode in the presence of oxygen. Thus, in view of the specification, the term of "pure metal" recited in these claims is interpreted by the examiner in this Office action as meaning: a metal that is substantially pure, instead of absolutely pure, and the term of "not incorporated" as recited in claim 52 as meaning: not substantially incorporated.
  3. In addition, the term of "unannealed" recited in claims 49 and 51 should be deleted.
  4. In claim 51, the term of "or IrO<sub>2</sub>" contradicts to what is defined for the top electrode which is defined as a "pure metal" in claim 40.
  5. In claim 54, the term of "electrode" should read as: --top electrode--.
- Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 40-47, 52-54 and 63, as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 102(a) as being anticipated by Miki et al. ("Miki"; WO98/01904, Jan. 15, 1998; also see US 6,309,894 for its English translation).

Miki discloses a microelectronic device structure (Figs. 10(1) and 10(2); also see col. 4, lines 34-54, and col. 7, line 59, through col. 8, line 29, in US 6,309,894), comprising: a bottom electrode layer (102), a ferroelectric oxide film (103; lead zirconium titanate (PZT), barium and/or strontium titanates (BST), or strontium bismuth tantalate (SBT); and a top electrode (metal Pt, which can be regarded as being substantially pure, and with oxygen not being substantially incorporated therein) formed in an oxygen enriched environment, wherein the ferroelectric film is naturally substantially stoichiometrically complete in oxygen concentration as it can be expressed with the stoichiometrical chemical formulas provided for the ferroelectric film (see col. 4, lines 34-54) without the need for a post annealing in oxygen and as the top electrode is formed with a method substantially same as the one used in the instant invention.

Art Unit: 2811

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 49, 51 and 61, insofar as being in compliance with 35 U.S.C.112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. ("Miki"; WO98/01904, Jan. 15, 1998; also see US 6,309,894 for its English translation) in view Park et al. ("Park"; 5,892,254)

The disclosure of Miki is discussed as applied to claims 40-47, 52-54 and 63 above.

Although Miki does not expressly disclose that the top electrode can also be formed of Ir, or Rh, one of ordinary skill in the art would readily recognize that each of Ir and Rh can also be commonly used for the top electrode in a ferroelectric capacitor structure for achieving stable capacitor performance, as evidenced in Park (see col. 1, lines 36-41).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the microelectronic device of Miki with the top electrode being made of Ir and Rh, as taught in Park, so that a microelectronic device with desired material choice and stable capacitor performance would be obtained.

***Response to Arguments***

8. Applicant's arguments filed on 8-15-03 have been fully considered but they are not persuasive.

Applicant's main arguments include: Miki fails to teach to form the top electrode in direct contact with the capacitor insulating film, as there is a layer 104 therebetween. In response, it is noted that, the top electrode layer (105) in Miki is indeed directly formed on and in contact with the capacitor insulating film (103), as shown in Figs. 10(1) and 10(2). In Embodiment 1 that is not cited by the examiner (see col. 6, line 36 through col. 7, line 58), an oxygen deficient layer 201 is formed (naturally from the insulting film 103) during the formation of the metal top electrode without the presence of oxygen. This layer (201) is then converted to layer 104 with additional oxygen being added in through post annealing. In Embodiment 2 (see col. 7, line 59, through col. 8, line 50) that is cited in the claim rejections by the examiner, the formation of such oxygen deficient layer as layer 201 does not occur due to the presence of oxygen during the formation of the top electrode. Therefore, the top region of the capacitor insulating film (103) in the cited Embodiment 2 in Miki naturally remains to be substantially stoichiometrically complete in oxygen concentration and in contact with the metal top electrode layer. Moreover, the top electrode in Miki can be metal Pt (see col. 8, lines 8 and 40), which can be regarded to be a substantially pure metal without substantial incorporation oxygen therein as no obvious impurities and no obvious Pt-Oxide phase(s) are includes therein.

Art Unit: 2811

***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is (703)306-5729. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Art Unit: 2811

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SH  
January 14, 2004



**SHOUXIANG HU**  
**PRIMARY EXAMINER**